Congruent Triangles

Objectives:
Learn and apply the properties of congruent triangles.

4–1

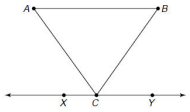
NAME _____ DATE _____

Practice

Student Edition
Pages 180–187

Classifying Triangles

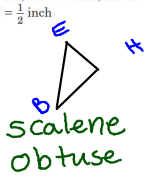
For Exercises 1–7, refer to the figure at the right. Triangle ABC is isosceles with AB > AC and AB > BC. Also, $\overline{XY} \parallel \overline{AB}$. Name each of the following.



1. sides of the triangle
2. angles of the triangle
3. vertex angle
4. base angles
5. side opposite $\angle BCA$
6. congruent sides
7. angle opposite $\overline{AC}$

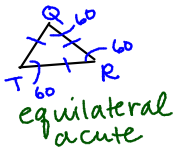
Use a protractor and ruler to draw triangles using the given conditions. Classify each triangle by the measures of its angles and sides.

8. $\triangle BHE$, $BE = 1$ inch, $m\angle E = 60$, $HE = \frac{1}{2}$ inch



scalene
obtuse

9. $\triangle QTR$, $m\angle T = 60$, $QT = TR = 4$ cm

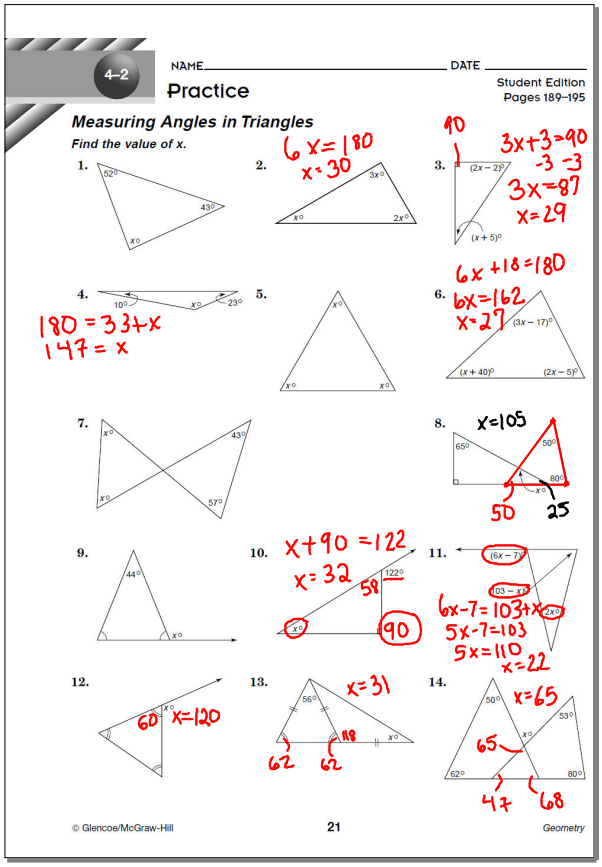


equilateral
acute

10. Find the measures of the legs of isosceles triangle ABC if $AB = 2x + 4$, $BC = 3x - 1$, $AC = x + 1$, and the perimeter of $\triangle ABC$ is 34 units.

$6x + 4 = 34$
$-4 \quad -4$
$6x = 30$
$x = 5$

$AB = 2(5) + 4 = 14$
$BC = 3(5) - 1 = 14$
$AC = 5 + 1 = 6$



4–2

NAME _____ DATE _____

Practice

Student Edition
Pages 189–195

Measuring Angles in Triangles

Find the value of x.

1. 52°, 43°, x°

2. 3x°, x°, 2x°

3. (2x − 2)°, (x + 5)°

4. 10°, x°, 23°

5. x°, x°, x°

6. (3x − 17)°, (x + 40)°, (2x − 5)°

7. x°, 43°, x°, 57°

8. 65°, 50°, 80°, x°

9. 44°, x°

10. 122°, x°

11. (6x − 7)°, (103 − x)°, 2x°

12. 60°, x°

13. 56°, 118°, x°

14. 50°, 53°, x°, 62°, 80°

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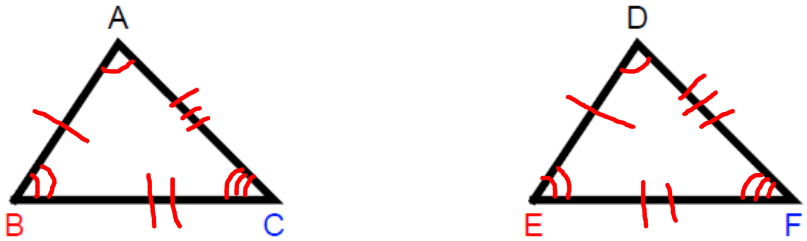
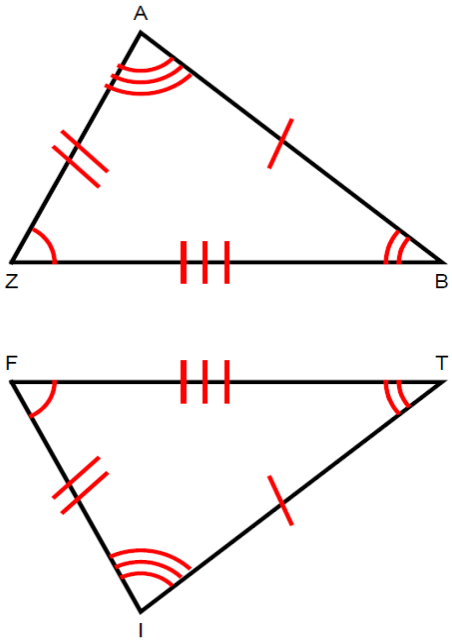
When two figures have the same shape and size, they are called **congruent**. We have already discussed congruent segments (segments with equal lengths) and congruent angles (angles with equal measures).

Two triangles are **congruent** if and only if their vertices can be matched up so that *corresponding parts* (angles and sides) of the triangle are congruent.



The congruent parts of the triangles shown below are marked alike.



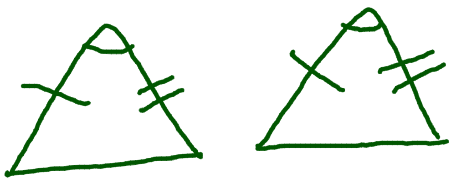
Types of Congruence

Postulate 12 Side-Side-Side (SSS) Postulate **If three sides of one triangle are congruent to three sides of another triangle, then the triangles are congruent.**

Postulate 13 Side-Angle-Side (SAS) Postulate **If two sides and the included angle of one triangle are congruent to two sides and the included angle of another triangle, then the triangles are congruent.**

SSS

SAS

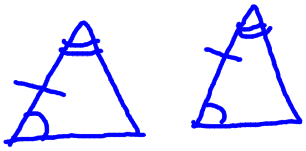


Postulate 14 Angle-Side-Angle Postulate **If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, then the triangles are congruent.**

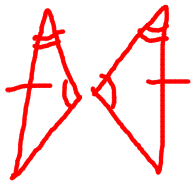
Angle-Angle-Side (AAS) Theorem If two angles and a non-included side of one triangle are congruent to the corresponding parts of another triangle, then the triangles are congruent.

HL Theorem If the hypotenuse and a leg of one right triangle are congruent to the corresponding parts of another right triangle, then the triangles are congruent.

ASA



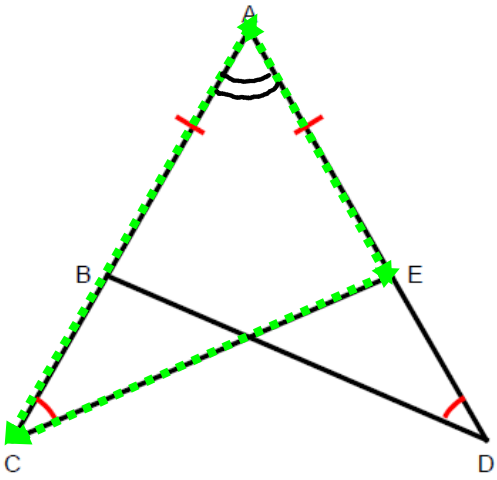
AAS



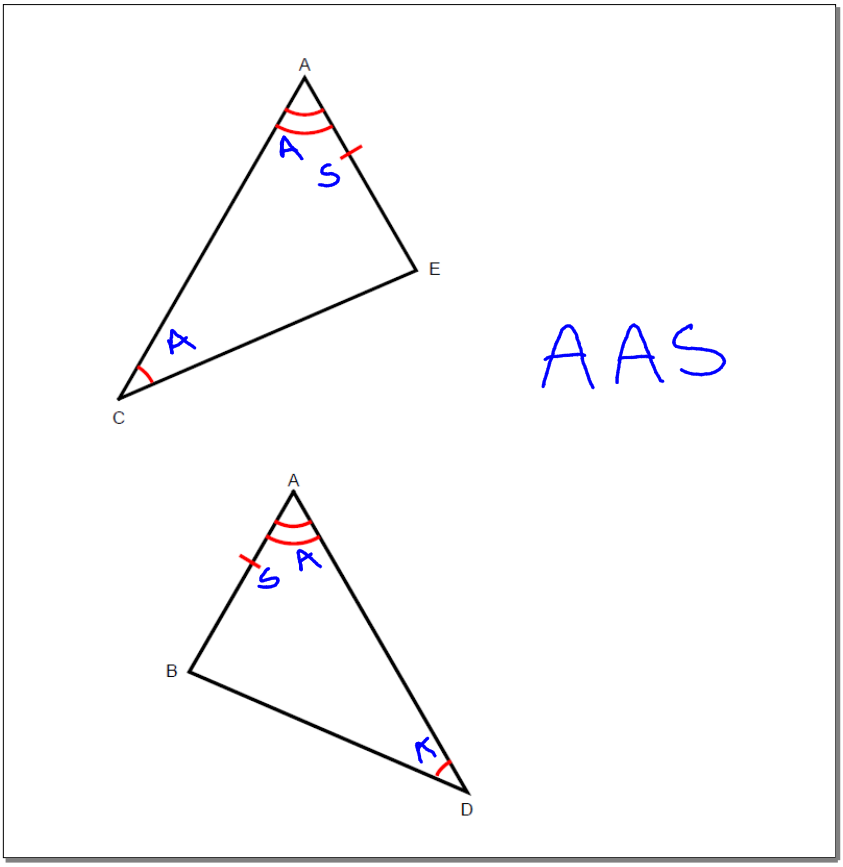
HL

Given: $\overline{AE} \cong \overline{AB}$, $\angle C \cong \angle D$

Prove: $\Delta ACE \cong \Delta ADB$



AAS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